Real-Time Water Quality Deployment Report

Paddy's Pond at Outlet

June 12, 2019 to August 9, 2019

Newfoundland Labrador

Government of Newfoundland & Labrador
Department of Municipal Affairs and Environment
Water Resources Management Division
St. John's, NL, A1B 4J6 Canada

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2019-06-12 to 2019-08-09

General

- Department of Municipal Affairs and Environment staff monitors the real-time web pages consistently.

Maintenance and Calibration of Instrument

- As part of the Quality Assurance and Quality Control protocol (QAQC), an assessment of the reliability of data recorded by an instrument is made at the beginning and end of the deployment period. The procedure is based on the approach used by the United States Geological Survey.
    - Upon deployment, a QA/QC Sonde is temporarily deployed *in situ*, adjacent to the Field Sonde. Depending on the degree of difference between each parameter from the Field and QAQC sondes a qualitative rank is assigned (See Table 1). The possible ranks, from most to least desirable, are: Excellent, Good, Fair, Marginal, and Poor. A grab sample is also taken for additional confirmation of conditions at deployment and to allow for future modelling studies.
    - At the end of a deployment period, a freshly cleaned and calibrated QAQC Sonde is placed *in situ*, adjacent to the Field Sonde. Values are compared between all parameters and differences are ranked for placement in Table 1.

Table 1: Qualitative QAQC Ranking

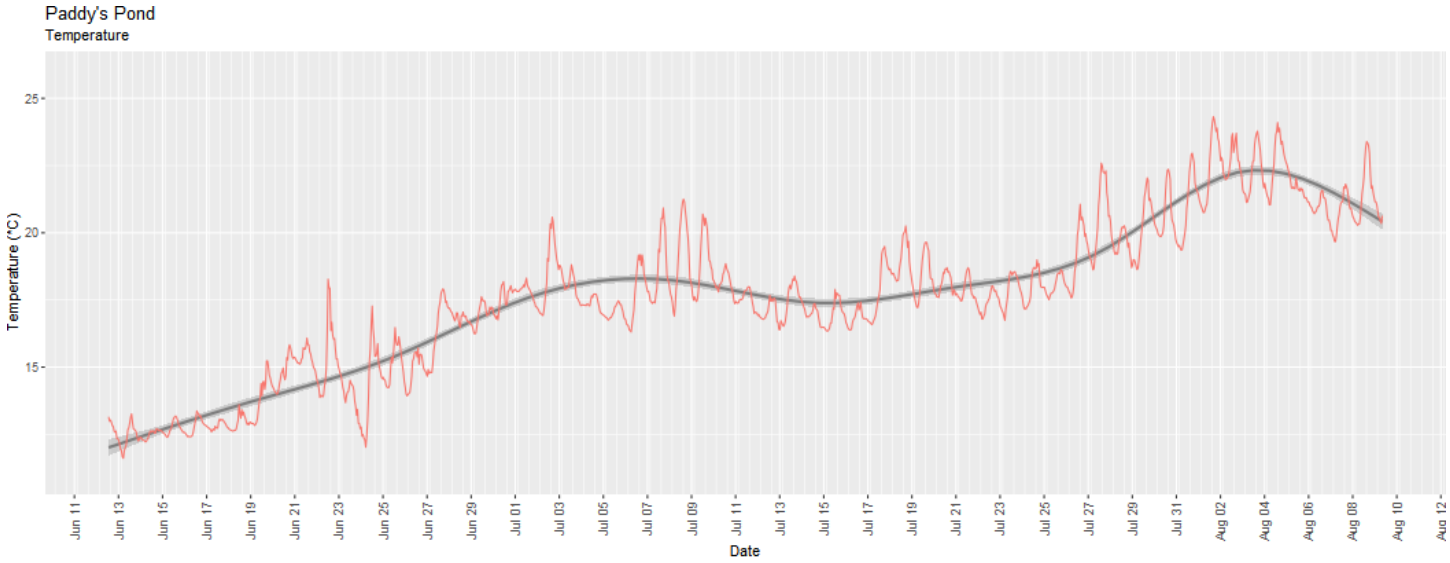
Station	Date	Action	Comparison Ranking				
			Temperature	pH	Conductivity	Dissolved Oxygen	Turbidity
Paddy's Pond at Outlet	June 12, 2019	Deployment	Good	Poor	Excellent	Excellent	Excellent
	August 9, 2019	Removal	Excellent	Poor	Good	Fair	Excellent

- A pH sensor problem likely related to an old pH tip resulted in "Poor" rankings at deployment and removal.

Data Interpretation

Temperature

Water Temperature is a major factor used to describe water quality. Temperature has major implications on both the ecology and chemistry of a water body, governing processes such as the metabolic rate of aquatic plants and animals and the degree of dissolved oxygen saturation.

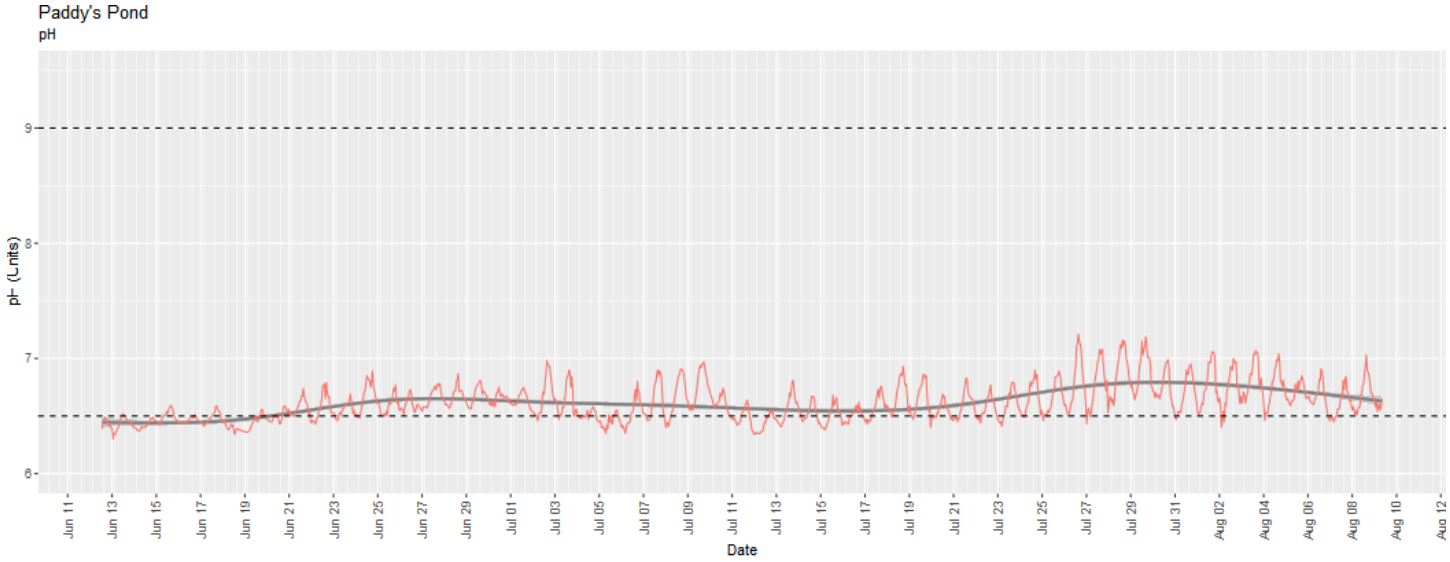


Mean	Median	Min	Max
17.61	17.62	11.61	24.32

- Water temperature increased over the deployment period with a brief cooling/plateau phase from early to late July. During the plateau phase, air temperatures fell to approximately 10°C with precipitation. Following the plateau, temperature increased once again.
- Peak summer temperature of 24.32°C appeared to have been reached in early August. A downward trend near the end of the deployment period will likely plateau for a period of a week or two before declining into the fall season.

pH

pH is used to give an indication of the acidity or basicity of a solution. A pH of 7 denotes a neutral solution while lower values are acidic and higher values are basic. Technically, the pH of a solution indicates the availability of protons to react with molecules dissolved in water. Such reactions can affect how molecules function chemically and metabolically.

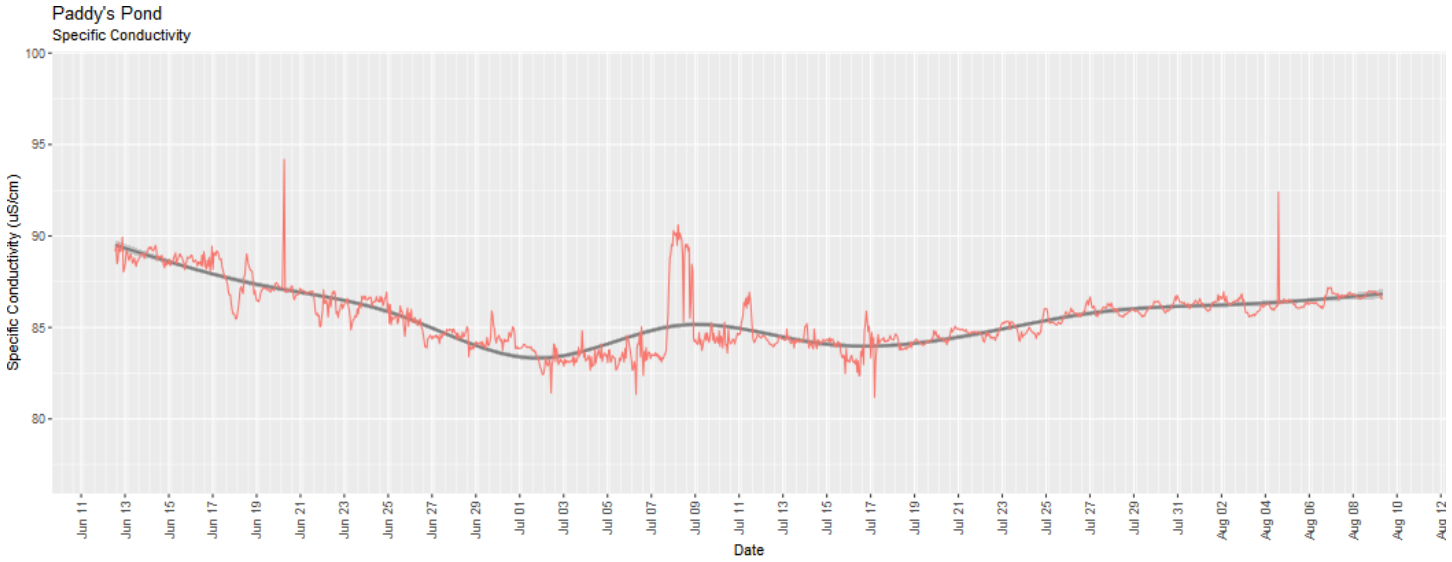


Mean	Median	Min	Max
6.62	6.58	6.30	7.21

- pH levels increased slightly during this deployment period. Initial values fell just below the CCME guideline and increased to just above the guideline within a week.
- Substantial diurnal variation occurred from mid-July onwards. Respiration by aquatic organisms changes the concentration of dissolved carbon dioxide in the water throughout the day, especially overnight when oxygen production is reduced relative to carbon dioxide levels. Carbon dioxide dissolved in water yields a slightly acidic solution.

Specific Conductivity

Conductivity relates to the ease of passing an electric charge – or resistance – through a solution. Conductivity is highly influenced by the concentration of dissolved ions in solution: distilled water has zero conductivity (infinite resistance) while salty solutions have high conductivity (low resistance). Specific Conductivity is corrected to 25°C to allow comparison across variable temperatures.

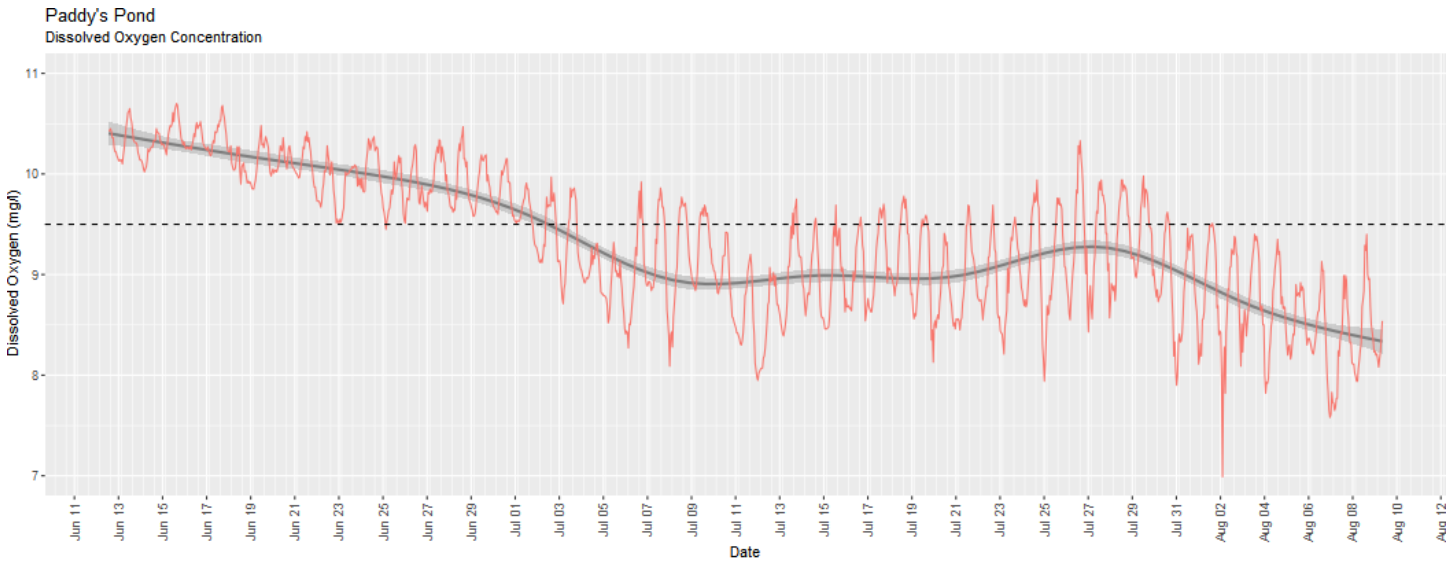


Mean	Median	Min	Max
85.57	85.56	81.18	94.18

- For the first third of the deployment period, specific conductivity declined and reached a mid-deployment plateau. In the final third of the deployment conductivity slowly increased.

Dissolved Oxygen

Dissolved oxygen is a metabolic requirement of aquatic plants and animals. The concentration of oxygen in water depends on many factors, especially temperature – the saturation of oxygen in water is inversely proportional to water temperature. Oxygen concentrations also tend to be higher in flowing water compared to still, lake environments. Low oxygen concentrations can give an indication of excessive decomposition of organic matter or the presence of oxidizing materials.

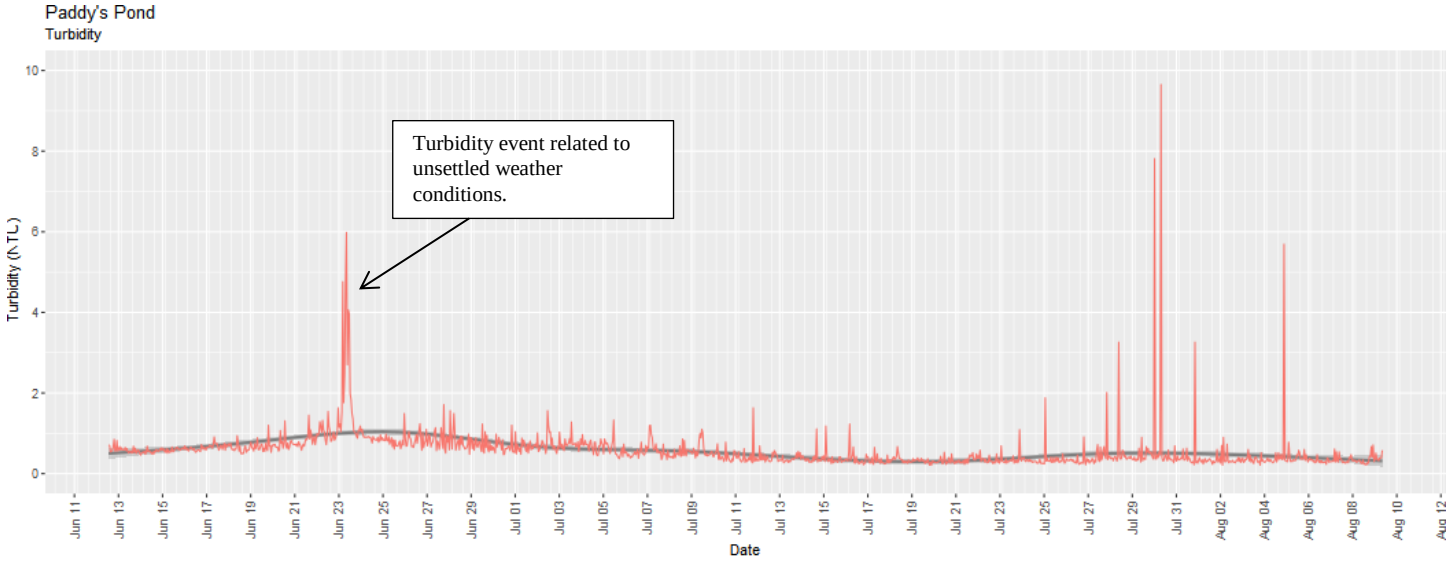


Mean	Median	Min	Max
9.3	9.4	7.0	10.7

- With increasing water temperature, dissolved oxygen concentrations declined over time. By July 2, DO concentrations were predominantly below the 9.5 mg/l guideline for the protection of early life stage cold water biota. This is expected for the time of year, as most aquatic organisms have developed beyond sensitive early stages by July.

Turbidity

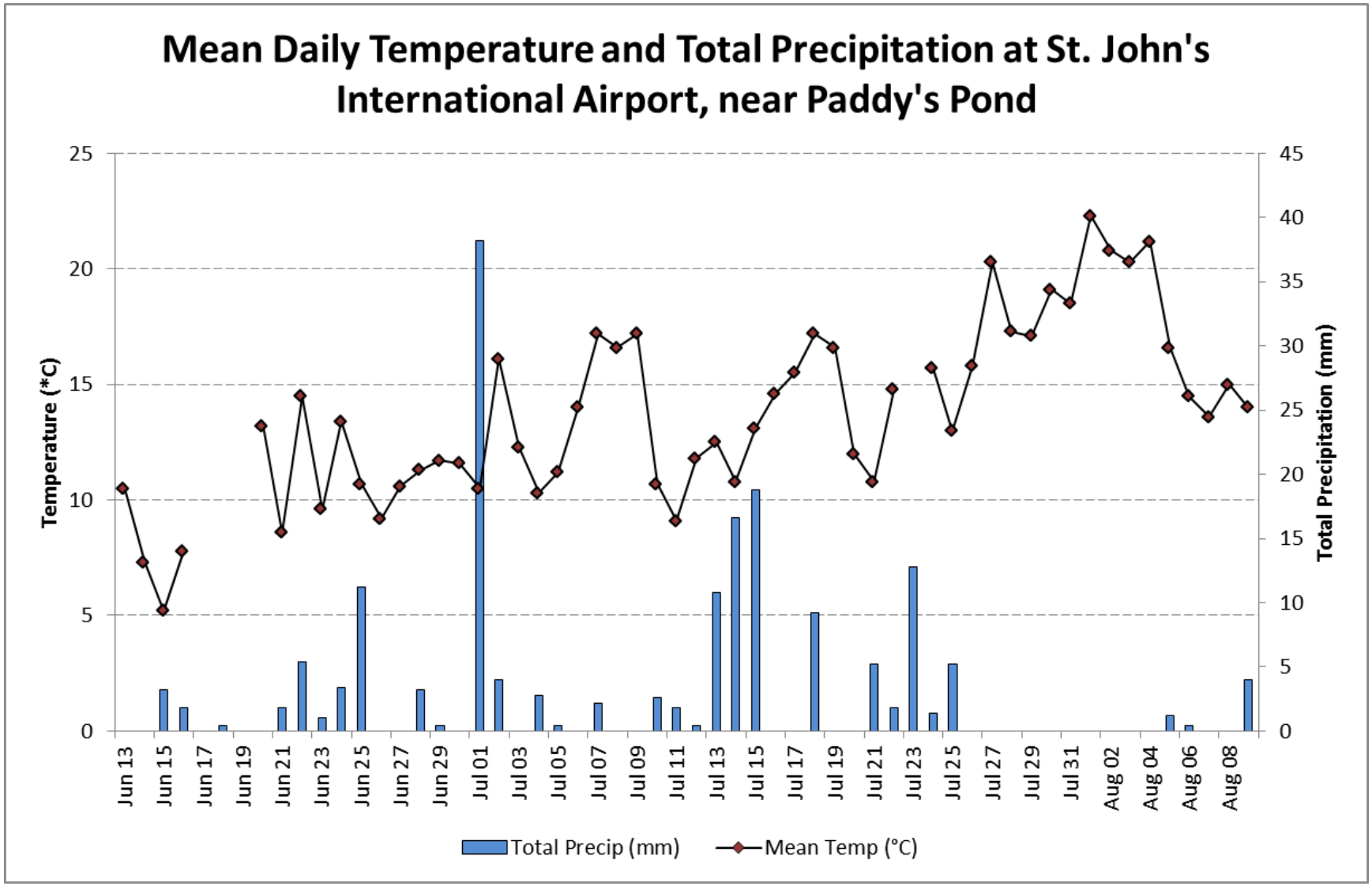
Turbidity is typically caused by fine suspended solids such as silt, clay, or organic material. Consistently high levels of turbidity tend to block sunlight penetration into a waterbody, discouraging plant growth. High turbidity can also damage the delicate respiratory organs of aquatic animals and cover spawning areas.



Mean	Median	Min	Max
0.57	0.48	0.21	9.65

- Turbidity levels were low during this deployment period with and baseline turbidity levels were likely influenced predominantly by suspended algae and silt stirred up by wave action.

Appendix


Mean Daily Temperature and Total Precipitation at St. John's International Airport, near Paddy's Pond
Temperature (*C)
Total Precipitation (mm)
25
20
15
10
5
0
45
40
35
30
25
20
15
10
5
0
Jun 13
Jun 15
Jun 17
Jun 19
Jun 21
Jun 23
Jun 25
Jun 27
Jun 29
Jul 01
Jul 03
Jul 05
Jul 07
Jul 09
Jul 11
Jul 13
Jul 15
Jul 17
Jul 19
Jul 21
Jul 23
Jul 25
Jul 27
Jul 29
Jul 31
Aug 02
Aug 04
Aug 06
Aug 08
Total Precip (mm)
Mean Temp (°C)